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Research on the innovation of ideological and Political Education Mode and the Integration of Intelligent Teaching Systems in the DigitalEra

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ABSTRACT

The research in this paper mainly focuses on the design of the quality assessment system of Ideological and Political Education to realize the innovation of Ideological and Political Education mode. The principal component analysis algorithm is used as the core algorithm of the assessment system, and combined with the system architecture model of hierarchical design, it realizes the collection, processing, analysis and assessment of the data on the quality of Ideological and Political classes. The research results show that the assessment system based on principal component analysis algorithm in this paper has a higher accuracy rate of education quality assessment compared to the evaluation system based on a single deep learning algorithm such as RBF neural network. At the same time, the system in this paper also has a higher assessment accuracy than the evaluation system using a combination of algorithms, and shows excellent stability performance when assessing the educational quality of 150 teachers. Using this system to assess the quality of Ideological and Political Education of 8 teachers, the comprehensive ranking is more reasonable than the original ranking. The Ideological and Political education quality assessment system designed based on the principal component analysis algorithm in this paper has a far-reaching impact on the innovation and intelligent development of the Ideological and Political Education model in the digital era.

Keywords: Ideological and Political education, educational model, intelligent teaching system, education quality assessment

1. Introduction

In recent years, with the rapid development of information technology, the speed and depth of the influence of artificial intelligence in all walks of life is increasing, and the field of education is no

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exception, ideological and political theory class is an important course for cultivating students' ideological and moral qualities and political theory [1]. The traditional teaching mode of Ideological and Political Science Classes faces many challenges, such as low interest, insufficient participation, and poor teaching effect. These problems not only reduce the teaching quality of Ideological and Political Science Classes, but also weaken the overall effect of Ideological and Political Education in colleges and universities [2].

At the same time, Ideological and Political affairs course is a key course to implement the fundamental task of establishing a moral character, and the teaching evaluation of Ideological and Political affairs course has the roles of obtaining feedback, judging and predicting, and value orientation. Teaching evaluation is a means to test the teaching quality of the Ideological and Political class in colleges and universities and a guide to lead the high-quality construction of the Ideological and Political class in colleges and universities [3]. Therefore, how to find the fit between artificial intelligence and the teaching evaluation of the Ideological and Political Science course, and promote the innovation of the teaching evaluation of the Ideological and Political Science course is a realistic problem that needs to be solved urgently for the teaching of the Ideological and Political Science course in colleges and universities [4].

In recent years, colleges and universities have continuously carried out the reform of teaching evaluation of Ideological and Political classes, giving full play to the important role of teaching evaluation in the reform of Ideological and Political class teaching. However, due to the special and complexity of the teaching evaluation of the Ideological and Political Science Classes in colleges and universities, which is different from that of the knowledge and skill courses, there are still many problems in the teaching evaluation, which seriously affects the proper function of the teaching evaluation, and facing up to these problems is a prerequisite for enhancing the conscientiousness of promoting the innovation of the teaching evaluation of the Ideological and Political Science courses in colleges and universities with artificial intelligence [5].

Literature [6] discusses that intelligent information education technology empowers the Ideological and Political Education model, which has a positive effect on enhancing students' interactive enthusiasm and participation. Literature [7] proposes the application of intelligent image recognition algorithms based on the theory of three-whole-parenting teaching to intelligently identify the classroom of Ideological and Politics teaching and to improve teachers' mastery of classroom students' behaviors. Literature [8] combines the literature review method, case analysis and expert interview strategy to reveal that artificial intelligence technology in the practice of Ideological education promotes the reform and innovation of personalized teaching and teaching content. Literature [9] systematically reviewed the performance of AI technology adding to Ideological and Political Education, and at the same time assessed and looked forward to the future value of AI technology in Ideological and Political Teaching, especially in the areas of course recommendation and teaching evaluation. All of the above studies reveal the positive role played by AI in Ideological and Political teaching.

In the research field of Ideological and Political teaching evaluation, the integration of AI technology has a positive impact on the improvement of teaching evaluation accuracy and scientific system. Literature [10] designed a set of curriculum Ideological and Political education quality assessment framework around curriculum design, teaching staff, student cognition, developmental evaluation and education system, which provides a positive reference for Ideological and Political teaching reform and innovation. Literature [11] explores the key factors determining the quality of Ideological and Political education, and based on this, constructs a systematic evaluation framework for Ideological and Political teaching, which helps students to develop critical thinking and independent learning ability, and has been recognized by students in practice. Based on the fuzzy mean clustering technology, [12] constructed a teaching evaluation model of Ideological and Politics, and based on the simulation experiment, it confirmed that the proposed teaching evaluation model has a certain degree of

intelligence and accuracy. Literature [13] examines and evaluates the current IPA education evaluation system, which is defective in transparency and evaluation indexes, and tries to introduce big data technology to establish an improved Ideological and Politics teaching evaluation system, which is more advantageous in terms of transparency and improved indexes.

This paper briefly introduces the principal component analysis algorithm from the mathematical model and computational steps of the principal component analysis algorithm, which lays the technical foundation for this paper to design the Ideological and Politics Education Quality Assessment System based on the principal component analysis algorithm. The architecture of this paper's education quality assessment system is divided into the data layer, algorithm layer and application layer using a layered design approach. The system obtains all kinds of education quality assessment related data from multiple channels as the input of the principal component analysis algorithm. The input education quality assessment index data are dimensionality reduced by principal component analysis, and different samples are sorted according to the sum of the products of the linear combinations and contribution rates of the different principal components determined after principal component analysis for education quality assessment. The performance of this paper's system is tested and compared with the evaluation system based on a single deep learning algorithm and a combination of algorithms to highlight the superiority of the performance of the education quality evaluation system designed based on the principal component analysis algorithm in this paper. Finally, the system designed in this paper is applied to the practice of education quality management to provide a useful reference for the intelligent management of the quality of ideological education.

2. Introduction to principal component analysis algorithms

Principal component analysis is a statistical method that reduces multiple indicators into a few composite indicators [14]. In practical applications, the problem of studying multiple indicators is often encountered. Because the number of variables is too large and there is a certain correlation between them, thus making the observed data to a certain extent reflect the overlap of information, and when there are more variables, the distribution of the study samples in high-dimensional space is more complex, which will inevitably increase the complexity of the analysis problem. It is natural to want to replace more variables with fewer composite variables that reflect as much information as possible about the original variables and are uncorrelated with each other. The use of this idea of dimensionality reduction has given rise to statistical methods such as principal component analysis.

2.1. Mathematical model for principal component analysis

A linear combination of the original p indicators is used as the new composite indicator. If the first linear combination selected, i.e. the first composite indicator, is denoted as F_1, it is generally natural to expect that as much information as possible from the original indicator will be reflected in F_1. The information here is expressed by the variance of F_1, i.e. the larger $Var(F_1)$ is, the more information F_1 contains. Therefore, the 1st principal component chosen among all linear combinations should have the largest variance. If the 1st principal component is not sufficient to fully represent the information of the p indicators, then the 2nd linear combination F_2 is considered, i.e., the 2nd principal component, and so on can create the 3rd, 4th, ..., and p th principal components, which are uncorrelated with each other and have decreasing variance.

Having n samples, each described by p indicators $x_1, x_2, \cdots, x_p$ yields the original data matrix:

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1p} \\ x_{21} & x_{22} & \cdots & x_{2p} \\ \vdots & \vdots & \vdots & \vdots \\ x_{n1} & x_{n2} & \cdots & x_{np} \end{bmatrix} = \left(X_1, X_2, \cdots, X_p\right) \tag{1}$$

where $X_j = \left(x_{1j}, x_{2j}, \cdots, x_{mj}\right)^T$, $j = 1, 2, \cdots, p$.

This is obtained by making a linear combination of the p vectors $X_1, X_2, \cdots, X_p$ of the data matrix X:

$$F_i = a_i X_1 + a_{2i} X_2 + \cdots + a_{pi} X_p, i = 1, 2, \cdots, p \tag{2}$$

where the combination coefficients are satisfied:

$$a_{1i}^2 + a_{2i}^2 + \cdots + a_{pi}^2 = 1, i = 1, 2, \cdots, p \tag{3}$$

The above coefficients are determined by the following principles:

1) $\operatorname{cov}\left(F_i, F_j\right) = 0\left(i \neq j, i, j = 1, 2, \cdots, p\right)$, i.e., F_i and F, are not correlated.

2) F_1 is the largest variance among the above combinations of $X_1, X_2, \cdots, X_p$, followed by $F_2, F_3, \cdots, F_p$, i.e:

$$\operatorname{var}\left(F_1\right) \geq \operatorname{var}\left(F_2\right) \geq \cdots \geq \operatorname{var}\left(F_p\right) \tag{4}$$

The total variance of the new composite indicator remains unchanged, i.e:

$$\sum_{i=1}^{p} \operatorname{var}\left(x_i\right) = \sum_{i=1}^{p} \operatorname{var}\left(F_i\right) \tag{5}$$

The composite indicator $F_1, F_2, \cdots, F_p$ as decided above is referred to as principal component 1, principal component 2, ..., principal component p of the original indicator respectively. From the above, it can be seen that using a portion of the previous principal components $F_1, F_2, \cdots, F_k (k < p)$, a larger portion of the information contained in the original indicator can be reflected, and the principal components are uncorrelated with each other. This allows the problem to be analyzed by replacing the original indicator with a few uncorrelated principal components.

Let the covariance matrix of $X = \left(X_1, X_2, \cdots, X_p\right)$ be S, where the p eigenroots are $\lambda_1 \geq \lambda_2 \geq \cdots \geq \lambda_p \geq 0$ in descending order, and mathematical statistics has proved that the combined coefficient $a_{1i}, a_{2i}, \cdots, a_{pi}$ of the i th principal component F_i of the original indicator is exactly the normalized orthogonal eigenvector corresponding to the i th eigenroot λ_i of S, and that there are:

$$\operatorname{cov}\left(F_i, F_j\right) = \begin{cases} \lambda_i, i = j \\ 0, i \neq j \end{cases} \tag{6}$$

Thus, the variance contribution of the first k principal component is:

$$\alpha(k) = \frac{\sum_{i=1}^{k} \operatorname{var}\left(F_i\right)}{\sum_{i=1}^{p} \operatorname{var}\left(F_i\right)} = \frac{\sum_{i=1}^{k} \lambda_i}{\sum_{i=1}^{n} \lambda_i} \tag{7}$$

In this way, to obtain the original p principal components, only the eigenroots of the covariance array S of the original metrics and the corresponding standard orthogonal eigenvectors are required.

2.2. Calculation steps of principal component analysis

1) Normalization of raw data in matrix X. Since the principal components are derived from the covariance matrix S, and the covariance matrix is subject to the influence of the index scale and order of magnitude, in order to overcome this defect, it is necessary to standardize the raw data:

$$z_{ij} = \frac{x_{ij} - \overline{x}_j}{S_j} \tag{8}$$

Among them:

$$\overline{x}_j = \frac{1}{n}\sum_{i=1}^{n} x_{ij}, S_j = \frac{1}{n-1}\sum_{i=1}^{n}\left(x_{ij} - \overline{x}_j\right)^2 \tag{9}$$

The standardized indicator covariance matrix is not affected by the indicator scale and order of magnitude.

2) Create a matrix of standardized P indicator correlation coefficients R. i.e:

$$R = \left(r_{ij}\right), r_{ij} = \frac{S_{ij}}{\sqrt{S_{ii}}\sqrt{S_{ij}}} \tag{10}$$

Among them:

$$S_{lj} = \frac{1}{n-1}\sum_{l=1}^{n}\left(x_{il} - \overline{x}_i\right)\left(x_{lj} - \overline{x}_j\right) \tag{11}$$

3) Solve for the eigenroots and eigenvectors of the correlation matrix R. The eigenroot can be viewed as an indicator of the strength of the principal component's influence, representing how much information about the original variable can be explained on average by the introduction of that principal component. If the eigenroot is less than 1, it means that the explanatory strength of that principal component is not as strong as the average explanatory strength of an original variable introduced directly. An eigenroot greater than 1 can generally be used as an inclusion criterion.

The characteristic root: $\lambda_1 \geq \lambda_2 \geq \cdots \geq \lambda_P > 0$, and the corresponding standardized orthogonal eigenvectors of the eigenvectors are: $A_i = \left(a_{1i}, a_{2i}, \cdots, a_{pi}\right)^T$, $i = 1, 2, \cdots, p$.

4) Calculate the variance contribution α_k and cumulative contribution $\alpha(k)$ of each principal component. i.e., there are:

$$\alpha_k = \frac{\lambda_k}{\sum_{i=1}^{p}\lambda_i}, \alpha(k) = \frac{\sum_{i=1}^{k}\lambda_i}{\sum_{i=1}^{p}\lambda_i} \tag{12}$$

The variance contribution ratio indicates the proportion of the variance of principal component F_i in the total variance, the larger this value is, the stronger the ability of principal component F_i to synthesize $X_1, X_2, \cdots, X_p$ information.

The cumulative variance contribution rate indicates how much information has been $X_1, X_2, \cdots, X_p$ extracted from the first k principal components. Generally speaking, if the cumulative contribution rate of the first k principal components reaches 85%, it indicates that the first k principal components basically contain all the information of all the measurement indexes, which not only reduces the number of variables, but also facilitates the analysis and study of practical problems.

5) Determine the number of principal components. The principle of determining the number of principal components is to obtain enough raw information with fewer principal components, which is actually a trade-off between k and $\alpha(k)$: on the one hand to make k as small as possible and on the other hand to make $\alpha(k)$ as large as possible. According to the needs of the actual problem, the cumulative variance of the first k principal components reaches a certain requirement, i.e. $\alpha(k) \geq 85\%$. Or the average of the p eigenroots is calculated first:

$$\overline{\lambda} = \frac{1}{p}\sum_{i=1}^{p}\lambda_i \tag{13}$$

It is sufficient to select all λ_i that satisfy $\lambda_i \geq \overline{\lambda}$. For standardized indicator data there:

$$\sum_{i=1}^{n}\lambda_i = p, \bar{\lambda} = 1 \tag{14}$$

Therefore it is sufficient to select all the characteristic roots greater than 1.

6) Write the principal components and find the value of the principal components for each sample. The principal components can be expressed in terms of the raw index $X_1, X_2, \cdots, X_n$ as:

$$f_i = a_{1i}x_1 + a_{2i}x_2 + \cdots + a_{pi}x_p, i = 1, 2, \cdots, k \tag{15}$$

The principal component value matrix can be obtained by substituting the original data (1) into (15):

$$F = \begin{bmatrix} f_{11} & f_{12} & \cdots & f_{1k} \\ f_{21} & f_{22} & \cdots & f_{2k} \\ \vdots & \vdots & \vdots & \vdots \\ f_{n1} & f_{n2} & \cdots & f_{nk} \end{bmatrix} \tag{16}$$

3. Construction of a system for assessing the quality of education

3.1. Overall system design

The overall design of the system is a necessary prerequisite for the smooth operation of the Ideological and Political Education Quality Assessment System based on Principal Component Analysis algorithm. In terms of system architecture, the layered design approach becomes the main choice for this system, including three major parts: data layer, algorithm layer and application layer. First, all kinds of education-related data such as teaching management system, student evaluation system, classroom behavior analysis system and other inputs are collected and stored by the data layer. As the data foundation of the whole system, comprehensiveness, accuracy and timeliness are its main tasks. The data provided by the data layer is analyzed and processed by the algorithm layer relying on the principal component analysis algorithm. Secondly, the algorithm layer, as the "heart" of the system, has a direct impact on the accuracy and reliability of the system evaluation results. Third, the application layer is the interactive interface of the system to the user, and its functions include data retrieval, presentation of results and report generation, etc. When designing the application layer, it is necessary to incorporate the user interface into the system. When designing the application layer, it is necessary to prioritize user experience in order to make the operation process smoother and provide real-time feedback.

3.2. Data Acquisition and Processing

When constructing a quality assessment system for Ideological and Political education based on principal component analysis algorithm, the key steps are data collection and processing. Various types of data are acquired from multiple sources to ensure the comprehensiveness and accuracy of the system. Among them, the main data sources, such as the teaching management system, student evaluation system, and classroom behavior analysis system, are all included in the scope of examination. Data such as course schedules, teacher information, student grades, and attendance records constitute the main content of the teaching management system, and are essential for evaluating the effectiveness of teaching and student learning.

Data can be divided into structured and unstructured. Structured data include student grades, attendance records and evaluation scores, which have a clear format and structure for easy storage and processing. Unstructured data includes text, audio, and video content, such as student feedback, classroom videos, and audio recordings, which are diverse and informative and complicated to store and organize. The moment of data affects the accuracy and reliability of assessment results. Data preprocessing technology, as the basis of data analysis, covers the process of data cleaning,

transformation and normalization. Missing values can be dealt with by using techniques such as mean-filling and interpolation.

3.3. Assessment model design

3.3.1. Establishment of a system of indicators for assessing the quality of education. In order to ensure that the constructed evaluation index system table can make the evaluation indexes can be digitized, but also can be convenient for students to evaluate, easy to operate, convenient for teachers to form their own teaching characteristics, so as to improve the teaching quality of the Ideological and Political classroom. In this paper, we mainly carry out digital evaluation from the three major aspects of teaching attitude, teaching ability and teaching effect, and construct the evaluation index system as shown in Table 1.

Table 1. Evaluation index system

Primary indicator	Secondary indicator
Teaching attitude	Be concerned and strictly require students (X1)
	Lecture seriously (X2)
	Teaching proficiency, deep entry (X3)
	Reality combines theory (X4)
	Highlight (X5)
	Clear board writing (X6)
Teaching ability	Teaching by aptitude (X7)
	Reasonable assignment (X8)
	Flexible teaching methods (X9)
	The cultivation of theoretical knowledge and professional ability (X10)
Teaching effect	Master the knowledge (X11)
	Ability to mobilize students' passion (X12)

3.3.2. Methods of evaluating the quality of education. The correlation matrix of principal component analysis is composed of different indicators for evaluating the educational quality of Ideological and Political courses, and different samples are sorted according to the sum of the products of the linear combinations and contribution rates of different principal components determined after principal component analysis to evaluate the educational quality. The specific steps are as follows:

The p variables of a n sample are transformed by transforming the original variables X_i into principal components, which are linear combinations of the original variables, i.e., they are $X_1, X_2, \cdots, X_p$ synthesized into $k(k < p)$ variables $(F_1, F_2, \cdots, F_k)$ and the synthesized variables $F_1, F_2, \cdots, F_k$ are called the 1st, 2nd, ..., and k th principal components of the original variables, respectively, and are denoted as:

$$\begin{aligned} F_1 &= a_{11}X_1 + a_{21}X_2 + \cdots + a_{p1}X_p \\ F_2 &= a_{12}X_1 + a_{22}X_2 + \cdots + a_{p2}X_p \\ &\cdots \\ F_k &= a_{1k}X_1 + a_{2k}X_2 + \cdots + a_{pk}X_p \end{aligned} \tag{17}$$

Taking the variance contribution ratio $\beta_i (i = 1, 2, \cdots, k)$ of different eigenvalues as the weighting coefficient, the comprehensive evaluation function $F = \beta_B F_1 + \beta_2 F_2 + \cdots + \beta_k F_k$ is used to calculate the scores of each sample, and then the ranking is carried out to evaluate the educational quality of the Ideological and Political course. Finally, the Ideological and Political education quality assessment system designed in this paper is used for data processing and analysis.

3.4. System implementation

The use of microservice architecture in the system architecture design helps to improve the scalability and maintainability of the system. The architecture splits the system into multiple independent service modules, including but not limited to various functions such as data acquisition, data processing, model training, and result display. Service modules communicating through APIs reduce the difficulty of deployment and expansion, bringing a greater degree of flexibility and reliability. To ensure the high availability and fault tolerance of the system, containerization technologies such as Docker are adopted to transform each service module into a container, and management and scheduling are carried out through scheduling tools such as Kubernetes. Automatic scaling and fault recovery are its main realization goals. System testing is a comprehensive examination of the overall system and simulates real-world scenarios to understand the performance of each situation. Improve coverage and efficiency using automated testing tools to execute and generate test scripts.

4. Testing and application of assessment systems

4.1. System performance testing

4.1.1. Test environment and objects. In order to analyze the performance of the Ideological and Political Education Quality Assessment System based on the Principal Component Analysis algorithm, it is tested by simulation, and the parameters of the simulation test environment are set as shown in Table 2.

Table 2. Systematic test environmental parameters

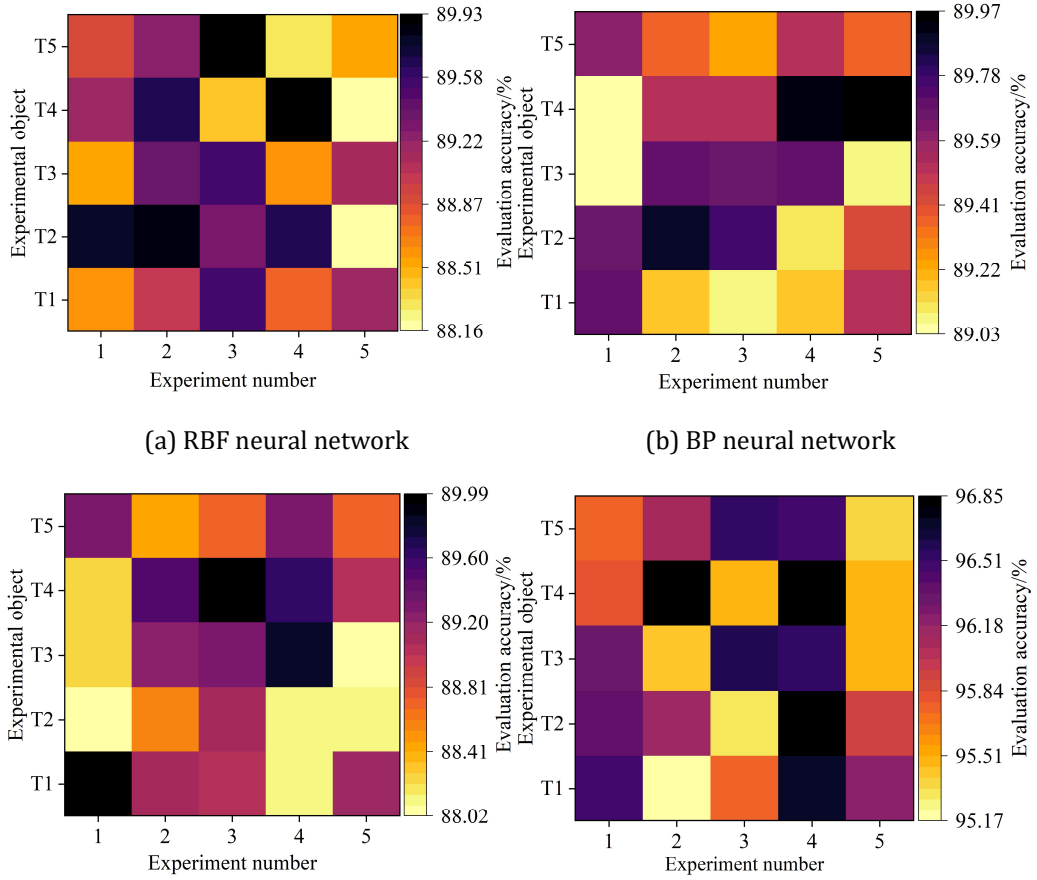
Environment type	Parameter description	Parameter value
Hardware	CPU	Intel Core i5 10500
	Memory	DDR4 2666 8GB
	Main board	B450M MORTAR
	Hard disk	Western data blue dish 1TB
Software	Programming tool	Java
	Operating system	Linux

In order to generalize the results of the assessment of the quality of Ideological and Political education, the teachers who have a large number of classes were chosen as the test subjects, which were recorded as T1-T5, and their education quality data were collected respectively, and the sample data were obtained as 5143, 5036, 3842, 4175, and 3092, respectively.

4.1.2. Comparison of single method system performance. The educational quality assessment systems of RBF neural network, BP neural network and echo state network are selected for comparison experiments [15-16], and the correct rate of the quality assessment of Ideological and Political education is adopted as the result evaluation index. Randomly select 1500 sample data from the sample data to form a validation sample set, and the others as a training sample set, to obtain the correct rate of education quality assessment of various systems as shown in Figure 1, (a)-(d) are the results obtained from BF neural network, BP neural network, echo state network and principal component analysis algorithm, respectively. Statistics on the correct rate of education quality assessment in the figure show that:

1) The average value of the correct rate of the quality assessment of Ideological and Political education of RBF neural network, BP neural network and echo state network is lower than 90%, which indicates that the error rate of the quality assessment of education is higher than 10%, which is mainly due to the fact that they are only modeling the quality of education in one direction, and they can not comprehensively describe the characteristics of changes in the quality of education, which leads to the undesirable effect of the assessment of the quality of Ideological and Political education.

2) The average value of the correct rate of the quality assessment of Ideological and Political education of the system in this paper is higher than 95%, compared with RBF neural network, BP neural network and echo state network, the correct rate of the quality assessment of Ideological and Political education of the principal component analysis algorithm has been greatly improved, and the error rate of the assessment of the quality of education has been reduced, this is due to the fact that the principal component analysis method, through the operation of dimensionality reduction, picks the main indicators from the indicators affecting the quality of Ideological and Political education, and the principal component analysis method, through the operation of dimension reduction, picks the main components, modeling education quality from the main multiple directions, comprehensively describing the characteristics of education quality changes, and obtaining a better education quality assessment effect, and the comparison results verify the superiority of the Ideological and Political education quality assessment system of the principal component analysis algorithm.



(a) RBF neural network (b) BP neural network

(c) Echo state network (d) Principal component analysis

Fig. 1. Comparison results with single method

4.1.3. Comparison of system performance of component methods. In order to further test the performance of the Ideological and Political education quality assessment system of principal component analysis, the combination education quality assessment system is selected for comparison, which combines the RBF neural network, BP neural network, and echo state network, and the weights of each neural network are determined in a random way, and the correct rate of its education quality assessment is shown in Figure 2. Comparison of the correct rate of the quality assessment of Ideological and Political education in the figure can be found that the correct rate of the quality assessment of Ideological and Political education of the combination system is also lower than the correct rate of the education quality assessment of the principal component analysis algorithm in this paper, which further verifies the superiority of the quality assessment system of Ideological and Political education of the principal component analysis algorithm.

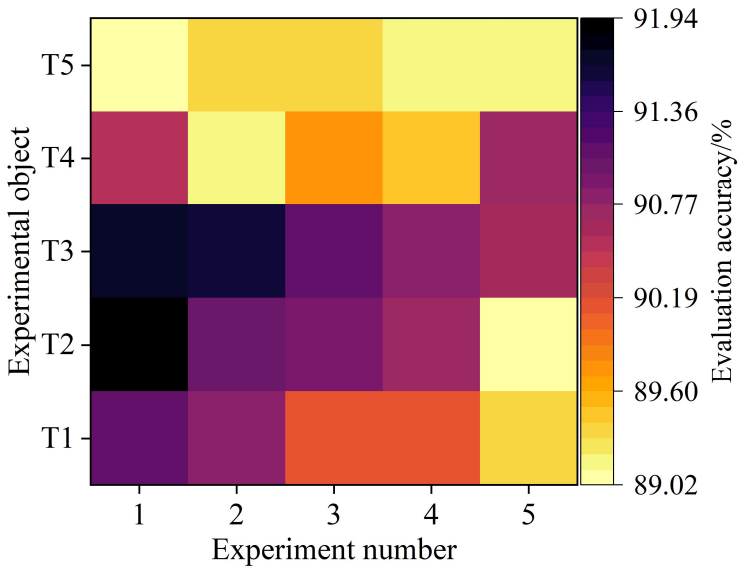


Fig. 2. Evaluation accuracy of composite system

4.1.4. System stability testing. In order to test the stability of the Ideological and Political education quality assessment system of principal component analysis, 150 Ideological and Political teachers are selected as test objects for simulation test, and the correct rate of assessment is counted, and the results are shown in Fig. 3. From the figure, it can be seen that for 150 teachers, the correct rate of education quality assessment by principal component analysis is higher than 95%, and very stable education quality assessment results are obtained, which can be applied to the actual education quality management.

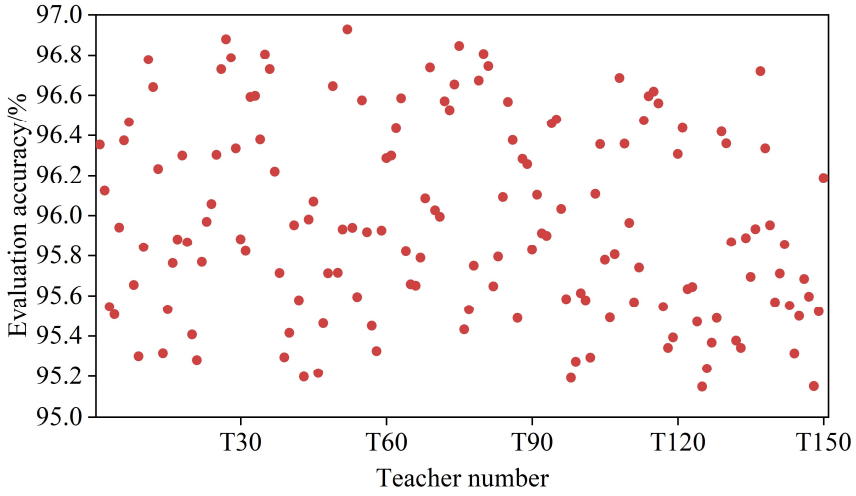


Fig. 3. The education quality evaluation accuracy of 150 teachers

4.2. Empirical evidence of system applications

4.2.1. Data acquisition. Taking eight Ideological and Political teachers in a local undergraduate college as an example, noted as a-h respectively, students of a teaching class taught by each teacher were randomly selected to evaluate the quality of the teacher's education in an anonymous questionnaire, with five options A, B, C, D, and E set for each evaluation index, and the contents of the options in order of priority: A very much in line with the B is basically in line with the B is unsure of C is not sure of D is basically not in line with the D is not in line with the D is not basically in line with the D is not in line with the D is very much not in line with the E, and the option The corresponding

assignments were 5, 4, 3, 2, 1. Peer evaluation was conducted in the same way. The data from the returned questionnaires were organized into the statistics shown in Table 3. It can be seen from the table that the student and peer evaluation scores obtained by different teachers varied, and overall the teaching quality scores of the eight Ideological and Political Science teachers were located between 3 and 5.

Table 3. Education quality evaluation score data

Teacher	a	b	c	d	e	f	g	h
X1	4.11	3.85	4.38	4.06	4.05	3.48	4.15	3.92
X2	3.64	4.21	4.06	4.59	4.60	3.58	4.22	4.01
X3	4.3	4.55	4.20	3.91	4.19	3.29	4.4	3.98
X4	3.94	4.89	3.93	4.01	4.69	3.45	3.43	4.68
X5	4.42	3.59	4.68	4.07	3.88	3.62	4.53	4.71
X6	4.02	4.41	4.65	3.98	3.53	3.50	3.92	4.45
X7	4.11	4.30	3.86	4.03	3.69	3.62	4.71	4.81
X8	3.78	3.36	4.25	4.29	4.78	3.36	3.80	4.47
X9	4.63	4.76	3.99	4.11	4.25	3.79	4.46	4.44
X10	4.32	3.77	4.10	4.32	4.05	3.37	3.57	4.44
X11	4.22	3.49	4.03	4.40	4.38	3.43	4.66	4.25
X12	4.68	3.86	4.58	4.31	4.93	3.43	3.94	4.32

4.2.2. Data analysis. The data in the study are mainly processed through the education quality assessment system constructed based on the principal component analysis algorithm in this paper. Firstly, the principal component analysis algorithm is used to calculate the eigenroot and variance contribution ratio of all variables, and the results are shown in Table 4. From the table, it can be seen that the eigenvalues of the first three principal components are greater than 1, and the cumulative contribution rate of variance is 88.349%, which basically responds to the information provided by all the variables, indicating that the first three principal components are significantly representative.

Table 4. Characteristic root and variance contribution

Component	Eigenvalue	Variance contribution	Cumulative variance contribution
1	6.872	51.958	51.958
2	3.467	26.214	78.172
3	1.346	10.177	88.349
4	0.748	5.656	94.005
5	0.457	3.455	97.460
6	0.162	1.225	98.685
7	0.064	0.484	99.169
8	0.038	0.287	99.456
9	0.027	0.204	99.660
10	0.023	0.174	99.834
11	0.014	0.106	99.940
12	0.008	0.060	100.000

Through the principal component analysis of the obtained principal component factor analysis after the loading matrix, the results are shown in Figure 4, the height of the bars and lines in the figure indicate the factor loadings of each indicator variable on the first, second and third principal components, respectively. As can be seen from the figure, the loadings of almost all evaluation factors

on the first principal component are positive, indicating that the first principal component is an evaluation index that combines the comprehensive evaluation of the vast majority of the factors, among which the factors X1, X2, X3, X4, X5 and X6 have higher loadings on the first principal component, which mainly responds to the attitude of Ideological and Political teachers' teaching, and at the same time, its principal component contribution is as high as 51.958%, which has a very high reference value. The loadings of factors X7, X8, X9 and X10 on the second principal component are significantly higher than the other factors, reflecting the teachers' teaching ability in the evaluation of the quality of Ideological and Political education, and its principal component contribution is 26.214%. The loadings of X11 and X12 on the third principal component are higher than other factors, which mainly show the teachers' teaching effectiveness.

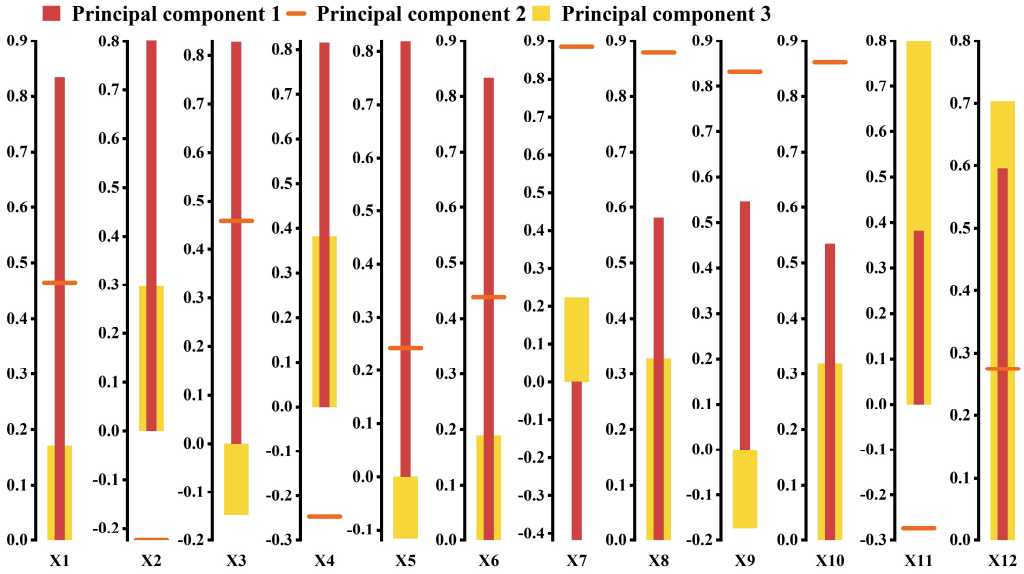


Fig. 4. Principal component load

The main component score matrix can be calculated according to Eq:

$$\begin{aligned} F1 &= 0.835X1 + 0.801X2 + 0.827X3 + 0.815X4 + 0.818X5 + 0.834X6 - 0.418X7 \\ &\quad + 0.581X8 + 0.547X9 + 0.535X10 + 0.382X11 + 0.595X12 \\ F2 &= 0.465X1 - 0.225X2 + 0.459X3 - 0.246X4 + 0.242X5 + 0.438X6 + 0.884X7 \\ &\quad + 0.879X8 + 0.833X9 + 0.862X10 - 0.272X11 + 0.275X12 \\ F3 &= 0.171X1 + 0.298X2 - 0.147X3 + 0.382X4 - 0.117X5 + 0.189X6 + 0.222X7 \\ &\quad + 0.328X8 - 0.172X9 + 0.319X10 + 0.798X11 + 0.703X12 \end{aligned} \tag{18}$$

The final score of the principal components is:

$$F = 0.51958F1 + 0.24214F2 + 0.10177F3 \tag{19}$$

The comprehensive evaluation rankings of all teachers and their original rankings were obtained through principal component analysis, and the results are shown in Table 5. As can be seen from the table, the overall trend between the comprehensive evaluation rankings obtained by using the principal component analysis algorithm and their original rankings is similar, but there is a significant difference in that the ranking of teacher b changes from seventh to sixth, and the ranking of teacher g changes from sixth to seventh. Teacher c's ranking changed from third to second, and teacher e's ranking changed from second to third. Combining the student and peer evaluation data, it can be concluded that the results of the comprehensive evaluation ranking derived from the principal component analysis are more reasonable, fairer to the evaluated, and more informative to the teaching

practice.

Table 5. Comparison between original ranking and comprehensive evaluation ranking

Teacher	Total score	Original ranking	Principal component score	Principal component ranking
a	50.14	4	21.468	4
b	49.03	7	20.921	6
c	50.71	3	21.970	2
d	50.08	5	21.369	5
e	51.02	2	21.909	3
f	41.92	8	17.852	8
g	49.79	6	20.892	7
h	52.48	1	22.237	1

4.3. Prospects for system applications

Teaching is the central work of the school on a regular basis. Teaching quality assessment is an important part of teaching management, an important means to improve teaching quality and school efficiency, and the foundation of the school's well-being. In order to promote the teaching quality monitoring and guarantee system of Ideological and Political courses, highlight the central position and role of teaching, innovate the education, teaching and management mode of Ideological and Political courses, improve the teaching level and quality of teaching of teachers, cultivate excellent talents with innovative spirit and practical ability who can adapt to the needs of the times, and at the same time improve the efficiency of students' learning through the activities of teachers' evaluation of teaching, it is very necessary to develop a set of teaching quality assessment system of Ideological and Political courses which is applicable to various aspects. It is necessary to develop a set of teaching quality assessment system for Ideological and Political courses which is applicable to many aspects.

In this paper, the educational quality assessment system for Ideological and Political courses designed based on the principal component analysis algorithm realizes the intelligent assessment of Ideological and Political teaching quality, makes the assessment of Ideological and Political teaching quality more scientific and comprehensive, and improves the accuracy and fairness of Ideological and Political education quality evaluation. The evaluation system has a wide range of applications, and the application of the system in the daily education and teaching of Ideological and Political can significantly recommend the innovative conversion of traditional Ideological and Political education to intelligent education, thus promoting the innovative development of the education mode of Ideological and Political in the context of the digital era. Therefore, the educational quality assessment system designed in this paper has a broad application prospect.

4.4. Realization of intelligent teaching system of Ideological and political course

In the process of realizing the material management system of ideological and political teaching of intelligent course, a relatively mature technical framework system is used. The system implements all the functions determined in the analysis and design stage, and some core functions are introduced below:

1) Intelligent crawling function of ideological and political materials Intelligent crawling and timing task setting of ideological and political teaching materials is one of the core functions of this system. Based on the traditional manual input materials, the system realizes the automatic crawling of materials through the crawler. The automatic collection and input of materials can greatly reduce the work of system administrators and improve the efficiency of ideological and political teaching materials.

2) Automatic extraction of text material labels For text materials uploaded by users or crawled text materials, the system can automatically analyze the text and extract the corresponding text labels.
3) Intelligent recommendation function of ideological and political materials In order to provide teachers with more humanized functions and improve the efficiency of users to obtain high-quality materials, the system adopts object-based collaborative filtering algorithm to recommend materials that may be of interest to users.

The research and development of intelligent course ideological and political teaching material management system will help professional course teachers to better acquire, organize and use the course ideological and political teaching material. A well-functioning and easy-to-use intelligent course ideological and political teaching material management system can better serve the course ideological and political teaching.

This paper designs and develops an intelligent course ideological and political teaching material management system, which integrates material management, material display, material intelligent crawling, intelligent recommendation material, automatic extraction of material labels and other functions, providing a link between ideological and political education and professional teaching for college educators. In the follow-up work, the existing recommendation algorithm will be improved to improve the quality and efficiency of material recommendation. In addition, the corresponding wechat mini program will be developed to facilitate users to query, collect and use ideological and political teaching materials anytime and anywhere.

5. Conclusion

In this paper, a quality assessment system for the education and teaching of Ideological and Political courses is designed and realized based on the principal component analysis algorithm. The experimental results show that the assessment system using principal component analysis algorithm has better performance than the assessment system using deep learning algorithms such as RBF neural network, BP neural network, echo state network and their combination algorithms, and the accuracy of education quality assessment is improved by 2%~5%. And this paper's system is still able to maintain more than 95% assessment accuracy when dealing with 150 teachers' education quality assessment data at the same time, which fully demonstrates the stability of this paper's assessment system. Using the system of this paper to assess the educational quality of the Ideological and Political teachers in a university, the comprehensive ranking obtained is more fair and reasonable on the basis of the consistency of the trend with the original ranking, and it can provide a direction guide for the innovation and intelligent transformation of the Ideological and Political education quality management method.

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